



Designation: D946/D946M – 20

Standard Specification for Penetration-Graded Asphalt Binder for Use in Pavement Construction¹

This standard is issued under the fixed designation D946/D946M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

1. Scope

1.1 This specification covers asphalt binder for use in the construction of pavements.

NOTE 1—For asphalt binders graded by viscosity at 60 °C, see Specification [D3381/D3381M](#). For performance-graded asphalt binder, see Specification [D6373](#).

1.2 This specification covers the following penetration grades:

40–50,	120–150, and
60–70,	200–300
85–100,	

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the standard.

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

[D5/D5M Test Method for Penetration of Bituminous Materials](#)

[D36/D36M Test Method for Softening Point of Bitumen \(Ring-and-Ball Apparatus\)](#)

[D92 Test Method for Flash and Fire Points by Cleveland Open Cup Tester](#)

¹ This specification is under the jurisdiction of ASTM Committee [D04](#) on Road and Paving Materials and is the direct responsibility of Subcommittee [D04.40](#) on Asphalt Specifications.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[D113 Test Method for Ductility of Asphalt Materials](#)
[D140/D140M Practice for Sampling Asphalt Materials](#)
[D1754/D1754M Test Method for Effects of Heat and Air on Asphaltic Materials \(Thin-Film Oven Test\)](#)
[D2042 Test Method for Solubility of Asphalt Materials in Trichloroethylene](#)
[D2872 Test Method for Effect of Heat and Air on a Moving Film of Asphalt \(Rolling Thin-Film Oven Test\)](#)
[D3381/D3381M Specification for Viscosity-Graded Asphalt Binder for Use in Pavement Construction](#)
[D6373 Specification for Performance Graded Asphalt Binder](#)
[D7553 Test Method for Solubility of Asphalt Materials in N-Propyl Bromide](#)

3. Manufacture

3.1 Asphalt binder shall be prepared by the refining of crude petroleum by suitable methods.

4. Properties

4.1 The asphalt binder shall be homogeneous and shall not foam when heated to 175 °C [350 °F].

4.2 The asphalt binder shall conform to the requirements given in [Table 1](#) or [Table 2](#), as specified by the purchaser. If no table is specified, the default shall be [Table 1](#). [Table 2](#) requirements limit the temperature susceptibility of asphalt over [Table 1](#) requirements. Asphalt binders that meet [Table 2](#) requirements will also meet [Table 1](#) requirements of the same grade.

5. Methods of Sampling and Testing

5.1 The material shall be sampled and the properties enumerated in this specification shall be determined in accordance with the following ASTM methods:

5.1.1 *Sampling*—Practice [D140/D140M](#).

5.1.2 *Penetration*—Test Method [D5/D5M](#).

5.1.3 *Softening Point*—Test Method [D36/D36M](#).

5.1.4 *Flash Point*—Test Method [D92](#).

5.1.5 *Ductility*—Test Method [D113](#).

5.1.6 *Thin Film Oven Test*—Test Method [D1754/D1754M](#).

5.1.7 *Solubility in Trichloroethylene*—Test Method [D2042](#).

5.1.8 *Solubility in N-Propyl Bromide*—Test Method [D7553](#).

TABLE 1 Requirements for Penetration-Graded Asphalt Binder for Use in Pavement Construction

	Penetration Grade									
	40–50		60–70		85–100		120–150		200–300	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Penetration at 25 °C [77 °F], 100 g, 5 s	40	50	60	70	85	100	120	150	200	300
Flash point, °C [°F] (Cleveland open cup)	230 [450]	...	230 [450]	...	230 [450]	...	220 [425]	...	175 [350]	...
Ductility at 25 °C [77 °F], 5 cm/min, cm	100	...	100	...	100	...	100	...	100 ^A	...
Solubility, % ^B	99.0	...	99.0	...	99.0	...	99.0	...	99.0	...
Retained penetration after thin-film oven test, %	55+	...	52+	...	47+	...	42+	...	37+	...
Ductility at 25 °C [77 °F], 5 cm/min, cm after thin-film oven test ^C	50	...	75	...	100	...	100 ^A	...

^A If ductility at 25 °C [77 °F] is less than 100 cm, material will be accepted if ductility at 15 °C [60 °F] is 100 cm minimum at the pull rate of 5 cm/min.

^B Use Test Method **D2042** or **D7553**.

^C The reference test method is **D1754/D1754M**. Optionally, Test Method **D2872** may be used as agreed between the purchaser and the seller. The two test methods give different degrees of heat conditioning (**D2872** is more severe), so the two methods may give different results for retained penetration and ductility.

TABLE 2 Requirements for Penetration-Graded Asphalt Binder for Use in Pavement Construction

	Penetration Grade									
	40–50		60–70		85–100		120–150		200–300	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Penetration at 25 °C [77 °F], 100 g, 5 s	40	50	60	70	85	100	120	150	200	300
Softening Point, °C [°F]	49 [120]	...	46 [115]	...	42 [108]	...	38 [100]	...	32 [90]	...
Flash point, °C [°F], (Cleveland open cup)	230 [450]	...	230 [450]	...	230 [450]	...	220 [425]	...	175 [350]	...
Ductility at 25 °C [77 °F], 5 cm/min, cm	100	...	100	...	100	...	100	...	100 ^A	...
Solubility, % ^B	99.0	...	99.0	...	99.0	...	99.0	...	99.0	...
Retained penetration after thin-film oven test, %	55+	...	52+	...	47+	...	42+	...	37+	...
Ductility at 25 °C [77 °F], 5 cm/min, cm after thin-film oven test ^C	50	...	75	...	100	...	100 ^A	...

^A If ductility at 25 °C [77 °F] is less than 100 cm, material will be accepted if ductility at 15 °C [60 °F] is 100 cm minimum at the pull rate of 5 cm/min.

^B Use Test Method **D2042** or **D7553**.

^C The reference test method is **D1754/D1754M**. Optionally, Test Method **D2872** may be used as agreed between the purchaser and the seller. The two test methods give different degrees of heat conditioning (**D2872** is more severe), so the two methods may give different results for retained penetration and ductility.

6. Keywords

6.1 asphalt binder; pavement; penetration

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